C. intermedia occurs also in Mr. Charles Moore's collection of British Carboniferous Entomostraca.

11. *Cythere Muensteriana*, n. sp. Pl. XX. figs. 11 *a*, 11 *b*.

Length $\frac{1}{14}$ inch, height $\frac{1}{36}$ inch.

The specimen from which we describe this species was sent to us as *Bairdia elongata*, from which, however, we are satisfied it is distinct.

It is nearly three times as long as high, and has a flatly convex dorsal border, abruptly sloping towards the obtusely pointed extremity; the other extremity is subtruncate; the ventral border is somewhat hollow; the valves are rather flat, thickest near the middle, and slope gently away to each extremity.

As a summary of Münster's species, we may add that—

Münster's No. 15.	*Cythere Okeni*	= *Leperditia Okeni* (comprising *L. subrecta* and many others).
,, 16.	*C. suborbiculata*	= *L. suborbiculata*.
,, 17.	*C. inflata*	= *Cytherella inflata*.
,, 18.	*C. Hisingeri*	= *Bairdia Hisingeri* (comprising *B. Schaurothiana*).
,, 19.	*C. elongata*	= *B. elongata*.
,, 20.	*C. bilobata*	= *Cythere bilobata*.
,, 21.	*C. subcylindrica*	= *Bairdia subcylindrica* (comprising *B. gracilis*).
,, 22.	*C. intermedia*	= *Cythere intermedia* (comprising *C. subreniformis*).

All of these, except *B. elongata*, we know to be more or less abundant in the Carboniferous strata of Britain and elsewhere; and some are Permian "recurrents."

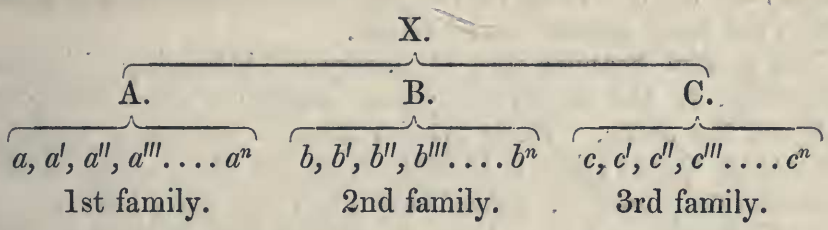
XLIV.—*The Darwinian Hypothesis supported by Observations on Crustacea.* By Fritz Müller, of Desterro.

Under the title of 'Für Darwin,' Dr. F. Müller has published a series of careful and minute observations on certain forms of Crustacea, which, he thinks, furnish a means of testing the soundness of the Darwinian hypothesis. Whether the facts described by him have really the bearing which he attributes to them may be a question; but there can be no doubt as to the value and interest attaching to his observations. The following abstract of some of the more important portions of this work is derived from the notice in the 'Bibliothèque Universelle,' 1865, "Bulletin Scientifique," p. 154.

According to Darwin's theory, the natural classification of

any group of animals is at the same time the genealogical tree of that group. Dr. Fritz Müller has endeavoured, in the first place, to construct this natural classification or genealogical tree for the class of Crustacea; and having constructed it, he has deduced from its structure certain necessary consequences. These deductions he has then endeavoured to verify. If they could not be verified, this would be a fatal blow to the Darwinian theory; but if they proved true, they would furnish, if not a proof, at least a strong presumption in favour of the theory. Hitherto his deductions have been verified; and thus his work presents us with a remarkable example of important results in natural history obtained by a purely deductive method, in opposition to most of the discoveries in that science, which are made by means of a sort of inductive groping.

Zoologists distinguish several natural families of Crabs. The species of one of these families, which may be designated as a, a^{I}, a^{II}, a^{III}, &c., have certain characters in common; and this is the case, according to Darwin's hypothesis, because they descend from a common ancestor, A, which already presented these characters. In the same way, the species b, b^{I}, b^{II}, b^{III}, belonging to a second family, present all the characters of the family because they descend from a common ancestor, B; and the species c, c^{I}, c^{II}, c^{III} of a third family have certain common characters derived from an ancestor C, and so on. Lastly, the species of all these families present certain ordinal characters common to all, and due to the fact that the forms A, B, C descended from a single primitive type, X. Thus the genealogical tree of these Crustacea would be as follows:—



Now it is to be remarked that in each of these families we find, as exceptions to the normal mode of life of the Crabs, certain terrestrial species. It is permissible to suppose *à priori* that these must present certain modifications of the respiratory apparatus, enabling them to respire air. And it is possible to imagine a multitude of arrangements capable of leading to this result; and if each terrestrial species has gradually renounced the aquatic mode of life on its own account, there is every probability that each of them would present a modification *sui generis*, very different from those presented by the others. If,

on the contrary, observation proved that all these terrestrial species present the same modification of the respiratory apparatus, the Darwinian theory could only account for them by assuming that these terrestrial species belonging to various families, which we may designate as a^t, b^t, c^t, &c., descended directly from a common type, T, which had already acquired the organic conditions of aërial respiration. But then the theory would contradict itself; for whilst the study of the respiratory organs would compel us to make a^t, b^t, c^t, &c. descend from T, the examination of the distinctive characters of the families leads us to assign to each of these types a different origin, as it makes a^t descend from A, b^t from B, and c^t from C.

The details of the organization of the respiratory apparatus in the land Crabs have hitherto been unknown; and thus a fine field of investigation was open for Dr. Müller. If he found in the terrestrial species of different families the same arrangement for effecting aërial respiration, the Darwinian theory would be irrevocably condemned; but if he should discover differences so complete as not to be reducible to the same type, this would certainly furnish a strong argument in favour of the theory: and the latter alternative has proved to be the true one.

In an *Aratus* which climbs upon the branches of the mangroves, and in a *Grapsus* which runs about the rocks of Santa Catharina, the air finds entrance to the branchial cavity by a fissure situated above the last pair of feet. These Crabs open this respiratory fissure by elevating the posterior extremity of the carapace. This aperture is consequently at the extremity of the branchial cavity opposite to that by which water enters and issues; for the apertures for the ingestion and egestion *of water* are in the same position in all Crabs.

The genera *Sesarma* and *Cyclograpsus*, belonging, like the preceding, to the family Grapsidæ, contain species living in holes on the shore. These species possess the same posterior respiratory fissure; but it is difficult to see this gaping, as the animals rarely open it, indeed only when they have been a very long time out of the water. This is due to a very curious arrangement, which does not exist in the preceding species, and which enables these animals for a long time to respire the air dissolved in the water that bathes their branchiæ. The pterygostomian region which separates the apertures for the ingestion and egestion of water is, as it were, reticulated, and bristles with small recurved hairs, already indicated by Milne-Edwards. The water issuing from the egestive orifice spreads in an instant over this network of hairs, and becomes saturated with air, after which it is conducted by a special arrangement into the ingestive aperture. The same portion of water may thus pass through

the branchial chamber a great many times, carrying always a fresh supply of oxygen with it. In moist air this circulation of water may be maintained for a very long time; but when the provision of water is evaporated, the Crab has recourse to the posterior aperture for aërial respiration.

The arenicolous *Ocypodæ* have become so completely estranged from an aquatic mode of life that a stay of one day in sea-water is sufficient to kill them. It has long been observed that in these animals the third and fourth pairs of feet are exceedingly close together. The contiguous surfaces of these legs are clothed at the margins with a dense coat of hairs. It has been supposed that these hairs were intended to diminish the friction of the surfaces; but this is evidently a mistake. Dr. Müller has discovered between the bases of these approximated legs an aperture leading into the respiratory cavity. This arrangement exists in several species of the family, in particular in certain *Gelasimi*, some of which inhabit the mangrove-swamps, whilst others run about upon the sand in open day.

One might perhaps be tempted to give a teleological explanation of these differences in the organization of the respiratory apparatus, and say that the *Ocypodæ*, for example, living in the sand, require to have the orifice more protected against the introduction of foreign bodies, and consequently more concealed, than the Grapsidæ. But this argument may be refuted by more than one reason. It is sufficient to state that a *Gelasimus* which lives far from the sands, in the mangrove-forests, in company with several Grapsidæ, nevertheless has the respiratory fissure concealed between the third and fourth pairs of feet.

The Crustacea present several very distinct modes of development—the development of the Podophthalma, that of the Edriophthalma, and that of the Entomostraca (including Cirripedes). Certain Podophthalma issue from the egg under their definite form; this is the case in the common Crayfish (*Astacus fluviatilis*) and in an Indian terrestrial *Gelasimus*. But all the marine Podophthalma appear to present themselves under larval forms, which is a further verification of the law which is evidently prevalent among the Annelida, Turbellaria, and Mollusca, in accordance with which the terrestrial or fluviatile species undergo no metamorphoses, whilst the marine species are subject to such changes. In any case, the Podophthalma with larvæ appear to be developed upon a single plan. In the larval state they present the form of a *Zoëa*. The *Zoëæ* are creatures entirely destitute of a thorax, that is to say, of that region of the body, which in the Crabs and Lobsters bears the five pairs of locomotive appendages to which the Decapoda owe their name. Their

abdomen, which is divided into several segments, and their tail are destitute of appendages, and the latter is formed of a single piece. Their mandibles are destitute of palpi, like those of insects. Their footjaws, of which the third pair are still wanting, have not yet passed into the series of buccal organs, but always present the form of bifurcate natatory feet. There is always a carapace, of which the sides are the seat of the function of respiration. The water, by means of which this function is performed, forms a current which passes beneath the margin of the carapace, and which is produced by the movement of a foliaceous or ligulate appendage of the second jaw. All these larvæ have also a pair of large compound eyes, often capable of motion; and this character, taken together with that of the carapace, which covers the anterior region of the body, enables them to be immediately recognized as young Podophthalma.

Totally different from these are the larvæ of the Entomostraca and Cirripedia (including *Sacculinidæ*), which are known under the name of *Nauplii*. Their oval body is destitute of all traces of divisions or segments; it bears a small, median, frontal eye, and three pairs of natatory feet, of which the first are simple and the others bifurcate. The *Nauplii* present no trace of carapace, of paired eyes, or of masticatory organs.

Lastly, the Edriophthalma present neither the *Zoëa*- nor the *Nauplius*-phase.

The fact that these three groups of Crustacea present essentially different modes of development is certainly worthy of remark. Darwin's theory, by assigning a common ancestor to all these Crustacea, presupposes that this ancestor itself presented these different modes of development. This hypothesis undoubtedly appears a bold one; and it has been reserved for Dr. Müller to demonstrate its truth by the discovery of species with a mixed development, presenting the characters of the different groups.

The most remarkable species in this respect is a Macrurous Crustacean of the genus *Peneus*, which quits the egg not under the form of a *Zoëa*, like the other Decapoda, but under that of a true *Nauplius*, perfectly similar to those of the Entomostraca. Beneath the skin of this larva the succeeding phase makes its appearance as a little Crustacean with a body divided into segments. Within the first two pairs of natatory feet two pairs of antennæ are formed, and vigorous mandibles make their appearance in the third pair. Besides these, new pairs of limbs originate further back. The integuments of the *Nauplius* are then cast off, and a true *Zoëa* issues from it, which can only be distinguished from the *Zoëæ* of the *Alphæi* and *Palæmones* by

the bifurcation of its tail, resembling that of the Copepoda. The compound eyes, indeed, are still wanting, but they soon make their appearance. This *Zoëa*-phase afterwards gives place to a phase which can only be designated as the *Mysis*-phase, so close is the resemblance of the young *Peneus* in this stage to a true Schizopod. Finally, a last moult converts this pseudo-*Mysis* into a true *Peneus*. This singular mode of development is not an isolated fact, for Dr. Müller has been able to ascertain the occurrence of very similar phenomena of metamorphosis in several allied species.

Here, then, we have the development of the Entomostraca connected with that of the Podophthalma. The *Nauplius*-form is the simplest under which a Crustacean can quit the egg. The *Zoëa*-phase is a subsequent one. The Entomostraca are hatched in the *Nauplius*-form, and attain their final form before reaching the *Zoëa*-phase. The Podophthalma live for a relatively longer time in the egg, and hence they generally quit it in the *Zoëa*-form without passing through the phase of *Nauplius*. Some, however, like *Peneus*, are hatched at an earlier relative period; and these present the whole normal series of Crustacean development, without the omission of a single phase.

The Edriophthalma (Amphipoda and Isopoda) appear to differ less essentially from the other Crustacea than would seem to be the case from their development, which is very different from that of the Podophthalma and Entomostraca. The Darwinian theory leads to the assumption that their ancestors must have passed through a *Nauplius*-phase or at least a *Zoëa*-phase, although these phases are wanting in the existing species of which we know the development. Dr. Müller, however, has discovered that the Isopoda of the genus *Tanaïs* still retain the characters of incontestable *Zoëæ*. Van Beneden had already remarked that *Tanaïs Dulongii*, although a true Isopod, nevertheless possesses a carapace like that of a Decapod. This led Dr. Müller to examine the genus *Tanaïs*, and he soon ascertained that these Crustacea, instead of having respiratory abdominal feet like the other Isopoda, have only locomotory feet, into which no blood-globules ever penetrate. To make up for this, respiration is localized in the lateral parts of the carapace, which are constructed for this purpose exactly as in *Zoëa*. The stream of water necessary for respiration is maintained, as in the *Zoëæ* and the adult Decapods, by the exognath of the second pair of maxillæ, which is deficient in all other Edriophthalma.

Dr. Müller records an exceedingly curious fact with regard to a species of the genus *Tanaïs* (*T. dubius* ?, Kr.), namely, the occurrence of a new kind of dimorphism in the males. In this

species, the individuals of which live together in myriads, the young males closely resemble the females. But the last moult gives origin to two very distinct forms of males. Some of them are furnished with enormous, elongated and very mobile nippers, and with anterior antennæ having as many as twelve or even seventeen olfactory filaments, of which the antennæ of the females do not exhibit one. The others retain short and heavy pincers, very similar to those of the females; but their antennæ have incomparably more numerous filaments than those of the first form of males.

The fact of this singular dimorphism does not appear to Dr. Müller to be inexplicable by the Darwinia hypothesis. Natural selection must have tended to favour the varieties in which the males could most readily make sure of the possession of the females. Hence, on the one hand, those males which were furnished with vigorous and mobile nippers fitted to seize the females, and, on the other, those furnished with olfactory organs adapted to guide them in the search after the females, have prevailed in the struggle for existence.

XLV.—*Remarks on Observations contained in Dr. Günther's Work on the Reptiles of British India.* By T. C. Jerdon, Surgeon-Major.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

Dr. Günther, in his elaborate work on the Reptiles of British India, in a note at page 99, writes as follows:—"Mr. Jerdon describes a Scaled Gecko (*Homonota fasciata*, Journ. Asiat. Soc. xxii. 408); but the descriptions given by that gentleman are so obscure (partly because he rarely hit upon the proper generic name, and partly because the few words serving for a description generally contain the most trivial characters) that in this case we are at a loss to imagine what sort of Lizard is the type of *Homonota fasciata*."

Now, Gentlemen, this paragraph is based upon an error, is unjust, not to say untrue, in part of its censure, and is offensive and illiberal in its tone, as are several other allusions to my brief Catalogue of Reptiles, compiled in 1849–1850; but these I share with others.

It is based upon error; for it so happens that the name and description of *Homonota fasciata* (as might have been seen by the manner of its interpolation) were given by Mr. Blyth at my